observed in the present work, for the reason that so many soils have a greater degree of acidity than existed in these experiments, and it is doubtful if they will ever be limed sufficiently to maintain them in a neutral condition."

This work should be of great interest to the ecologist and the physiologist, as well as to the agriculturist.—WM. CROCKER.

Upper Cretaceous floras.—The eastern gulf region in Tennessee, Alabama, and Georgia, discussed by BERRY[7] with reference to the Upper Cretaceous floras, includes that part of the Atlantic coastal plain bordering on the Gulf of Mexico and lying south and west of the southern Appalachian province and east of the Mississippi River. An excellent map in colors shows the exact geographic location of the different geological formations which contain determinable plant fossils, and it appears that the bulk of the fossil floras belong to the Tuscaloosa formation, with those of the Eutaw and Ripley floras meagerly represented.

The author gives a systematic arrangement of the plants found in the Upper Cretaceous of the Gulf region, with a historical sketch, an account of the lithologic characters of the materials associated with the fossils, and a discussion of the localities with plant remains. Photographs and diagrammatic sections help to elucidate the account arranged according to the different localities where plant fossils have been found. After a thorough analysis of the field observations made separately for the Eutaw, Ripley, and Tuscaloosa formations, the composition, origin, and evolution of these different Upper Cretaceous floras follow. The 151 described species from the Tuscaloosa formation represent 87 genera segregated into 48 families. The pteridophytes are represented meagerly, while the cycad-like plants, abundant in the Lower Cretaceous, are represented by a single species of *Podozamites* and *Cycadinocarpus*. Sixteen species of Coniferales of modern types, as *Pinus*, *Dammara*, *Sequoia*, occur with the curious extinct phylloclad type, *Andcovettia*, etc. The angiosperms constitute the bulk of the Tuscaloosa flora. The author explains the scarcity of the monocotyledons as largely due to the fact that the lack of differentiation of the leaf lamina and petiole precludes the regular shedding of their leaves, which are torn to shreds by the wind, and therefore unrecognizable. The dicotyledons of the Upper Cretaceous are of great interest as to their origin, for they appeared with great suddenness at the close of the Lower Cretaceous in America, Europe, and the Arctic region. The author believes that North America was near their center of radiation, with the facts in accord with their Arctic origin and with successive waves of migration sweeping southward.

Dealing specifically with the Tuscaloosa formation, BERRY emphasizes its delta character with its flora of a lowland coastal type, including a number of distinctly strand types, such as the species of *Murica*, the figs, and several

[7] BERRY, E. W., Upper Cretaceous floras of the eastern gulf region in Tennessee, Mississippi, Alabama, and Georgia. U.S. Geol. Survey, Professional Paper no. 112. pp. 117. *pls. 1–33*. 1919.

Lauraceae, Leguminosae, and Celastraceae. The members of the Myrtales also were probably dwellers in the dry or wet strand. Many of the plants probably demanded a heavy rainfall, with emphasis on the warm temperate rain forest types. Such areas as southern Japan or northern New Zealand offer many points of comparison with the Upper Cretaceous floras of the coastal plain. The climate then was equable within the limits embraced between warm temperate and subtropical. The floras of the Eutaw and Ripley formations are treated similarly by BERRY, who concludes the introductory portion of the monograph with a consideration of correlations and the presentation of a table of the distribution of the three floras minutely analyzed. The work ends with a detailed account of the fossil plants, with the description of several new species illustrated with 33 fine plates of geological scenery and fossil plants.—J. W. HARSHBERGER.

Wood structure and conductivity.—HOLMES[8] has made a quantitative study of the anatomy of ash wood, attention being directed chiefly to the size and proportion of the water-conducting elements in different parts of a shoot. As in the case of the hazel wood previously investigated by this author, year old ash shoots were selected, most of the specimens being typical coppice, stool shoots, long, thick, and unbranched. His results are presented in graphical form, a set of curves being constructed for each shoot.

Curve A gives the variation in area of the wood at selected levels along each shoot. Curve B, representing the absolute conductivity or total volume of transmitted water, is obtained by calculating the total number of vessels in a transverse section at the different levels and the average diameter of the cavities of these vessels. This curve shows a decline from the base to the apex of the shoot. Curve C serves as a measure of the specific (or relative) conductivity for water, or the percentage of wood area occupied by vessel cavities. In general this curve rises and then falls, the upper (younger) part of the stem being a better conductor of water per unit area than that nearer the base. An increase in the proportion of fibers in any part of the shoot, usually at the base where mechanical support is necessary, quite obviously lowers the specific conductivity in that portion of the stem.

In comparing the ash with the hazel wood, the writer finds in both a fall in absolute conductivity and a rise in specific conductivity from the base of the shoot to its apex, but the figures for specific conductivity are much higher in hazel than in ash, due to its greater number of conducting elements per unit area.

In the main, these results agree with those obtained by FARMER[9] for the two kinds of wood in question, in his extensive investigations for determining

[8] HOLMES, M. G., Observations on the anatomy of ash-wood with reference to water-conductivity. Ann. Botany **33**:255–264. *figs. 7.* 1919.

[9] FARMER, J. B., On the quantitative differences in the water-conductivity of the wood in trees and shrubs. Proc. Roy. Soc. **90**: 1918.